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INTELLECTUAL PROPERTY
OFFICE OF NEW ZEALAND
Te Pou Rāhui Hanga Hou

In the matter of the ~~Patents Act~~ 1953 and the Regulations thereunder

AND

In the matter of an application for Letters Patent numbered 299927 in the name of THE UNIQUE COMPANY.

G. Geron
#9
1-14-2000

CERTIFICATE

I hereby certify that the annexed is a true copy of the Provisional Specification as filed on 12 December 1996 with an application for Letters Patent numbered 299927 made by THE UNIQUE COMPANY.

This certificate is issued in support of an application for Patent registration in a country outside New Zealand.

AS WITNESS MY HAND this 17th day of December 1997.

Neville Harris

Neville Harris
Commissioner of Patents

299927

Patents Form No. 4 Our Ref: PZ501578

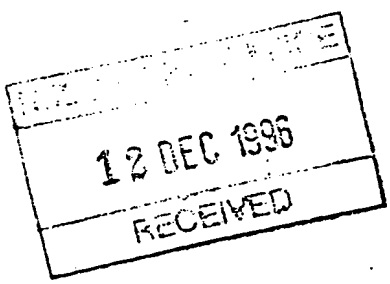
Patents Act 1953

PROVISIONAL SPECIFICATION

FLUID CONTROL VALVE

We, **THE UNIQUE COMPANY LIMITED,** a New Zealand company, of Unit E, 77 Cook Street, Auckland, New Zealand do hereby declare this invention to be described in the following statement:

PT0440218



BACKGROUND TO THE INVENTION

This invention relates to a fluid control valve and, in particular, although not necessarily solely, a valve suitable for the control of water and the mixing of hot and cold water and, preferably, the control of such mixed water to chosen outlets.

A number of fluid control valves are used throughout domestic and industrial plumbing installations. In circumstances where it is necessary to provide valves to divert fluid to alternative outlets and a variety of valves to mix incoming hot and cold water. In cases such as combined shower and bath installations, it would be preferable to have a valve capable of performing these multiple functions in combination and/or reducing the cost and complexity of the valves for mixing and diverting whether in combination or individually. Furthermore, conventional valves regularly require manual adjustment to adjust for water temperature. Particularly in the case of pressure loss on either the hot or cold water supplies, the manual adjustment necessary to regulate the temperature is a continuing problem.

OBJECT OF THE INVENTION

It is an object of the present invention to provide a fluid control valve which overcomes some of the disadvantages of the prior art or at least provides the public with a useful choice.

STATEMENTS OF INVENTION

Accordingly, in a first aspect, the invention may broadly be said to

consist in a fluid control valve comprising:

- a valve body;
- at least one inlet into said valve body;
- at least two outlets from said valve body;
- at least first and second cooperating and overlapping valve surfaces disposed between said at least one inlet and said at least two outlets;
- said first valve surface having at least one aperture therein to receive fluid from said inlet; and
- said at least second valve surface having at least two apertures therein such that either of said apertures may be aligned with said aperture in said first valve surface to allow flow through said valve surfaces through the aligned apertures; and
- wherein each of said at least two outlets are in communication with one of said at least two apertures in said second valve surface.

Preferably said valve surfaces are provided as planer disc surfaces with apertures being provided in said discs such that rotation of one disc with respect to the second disc controls alignment of the apertures.

Preferably said discs are provided as substantially circular planer discs.

Preferably said apertures comprise apertures covering a substantial portion of a 120° sector of said circular discs.

Preferably said rotation of said discs with respect to each other is provided by fixing one of said discs with respect to said valve body and rotating the other with a stepper motor.

Accordingly, in a second aspect, the invention may broadly be said to consist in a fluid control valve comprising:

- a valve body;
- at least one inlet for attachment to a hot water supply;
- at least one further inlet for attachment to a cold water supply;
- at least a first valve surface having at least one aperture therein;
- at least a second valve surface overlapping first valve surface and having at least one aperture therein and being rotationally mounted such that rotation of said second valve surface with respect to said first valve surface may align said apertures to control the quantity and mix of fluids from said hot inlet and said cold inlet;
- an outlet on an opposed side of said valve surfaces from said hot and cold inlets;
- a temperature sensor on the same side of said valve surfaces as said outlet;
- an electronically controllable drive means acting on at least one of said valve surfaces to control the rotation of one of said valve surfaces with respect to the other; and
- control means to receive an output from the temperature sensor and control said drive means to rotate said valve surfaces to achieve or maintain a desired outlet temperature.

Preferably said first valve surface is adjacent said inlets and has at least two apertures therein.

Preferably said valve also provides a mixing chamber intermediate of said valve surfaces and said outlets.

Preferably said temperature sensor is provided in said mixing chamber.

Preferably said drive means comprises a stepper motor and/or gearbox.

Accordingly, in a third aspect, the invention may broadly be said to consist in a fluid control valve to control the temperature and pressure of fluid supplied from said valve comprising:

- a valve body;
- at least one hot water inlet for attachment to a hot water supply;
- at least one cold water inlet for attachment to a cold water supply;
- at least two independently controlled valves in communication with said hot water inlet and cold water inlet respectively;
- a mixing chamber in communication with the distal side of each of said valves from said cold and hot water inlets;
- and the outlet in communication with said mixing chamber; and
- independently controllable drives provided on each of said valves to independently control the opening of said valves.

Preferably said valves comprise overlapping valve surfaces each having at least one aperture therein such that alignment of the apertures determines the flow through said valves and the alignment of the apertures is determined by rotation of one of said valve surfaces with respect to another.

Preferably said control means comprises a stepper motor or DC motor and/or gear boxes driving the rotation of one of said valve surfaces with respect to the other and stepper motors are provided independently on each of said valves.

Preferably a temperature sensor is provided in or adjacent said mixing chamber and connected to a control means to control said independent control of the valves to achieve or maintain said outlet temperature.

Preferably a pressure sensor is provided and connected to said control means to control outlet pressure.

Preferably at least two outlets are provided from said valve body and said valves may direct fluid to a mixing chamber in communication with a selected one of said at least two outlets.

Further aspects of this invention may become apparent from reading the description of preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described with reference to the drawings in which:

Figure 1: shows a schematic view of a shower and bath installation in which a preferred embodiment of the invention may be used;

Figure 2A: shows a plan view of two cooperating valve surfaces in accordance with one embodiment of the invention;

Figure 2B: shows an assembled plan view of the two surfaces of Figure 2A;

Figure 2C: shows a cross-sectional side elevation through the apparatus of Figure 2B;

Figure 3: shows a cross-sectional elevation through a control valve in accordance with a further embodiment of the invention;

Figure 4A: shows a cross-sectional elevation through a further embodiment of the invention;

Figure 4B: shows a cross-sectional elevation through a variation on the embodiment of Figure 4A.

Figure 5A: shows a cross-sectional elevation through a yet further embodiment of the invention;

Figure 5B: shows a cross-sectional elevation through the apparatus of Figure 5A on cross-section A-A;

Figure 5C: shows a further cross-sectional elevation through the apparatus of Figure 5A on cross-section C-C; and

Figure 5D: shows a cross-sectional plan view through the apparatus of Figure 5A on cross-section B-B.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Referring to Figure 1, the fluid control valve 2, in at least a preferred form, is shown in use in a typical domestic plumbing situation as shown generally by arrow 3. In this instance, the valve 2 is provided to control a fluid supply to either a shower or bath outlet and is controlled by a controller 4 linked to a user input means 5. This particular arrangement provides electronic control over the temperature and/or pressure outlet direction of the fluid between an incoming hot water inlet 6, cold water inlet 7 and either the shower head 8 or the spout for the bath 9. It can also be seen that the controller 4 may be provided with a power supply 10 which should be provided in a manner suitable for such bathroom installations in use in conjunction with plumbing installations. Aspects of this invention may be applicable to other installations whether electronically controlled or otherwise.

Referring to Figure 2, the valve surfaces in accordance with the preferred embodiment are shown in Figure 2A. There may comprise overlapping cooperating valve surfaces 11 and 12. Each of the valve surfaces 11 and 12 is provided with apertures which, upon suitable arrangement of the overlapping valve surfaces, allows flow through the valve surfaces.

In this preferred embodiment, the valve surfaces comprise substantially circular valve surfaces which are also substantially planar discs. The discs 11 and 12 are provided as one substantially fixed disc and a rotating disc. The fixed disc may be provided with two apertures 13 and 14 and the rotating disc with at least one aperture 15. Although each of these apertures, 13, 14 and 15 may comprise a series of apertures if desired, to provide the greatest

potential flow through the valve surfaces 11 and 12, they are provided as single discreet apertures.

As shown in Figure 2B, the valve surfaces may be overlapped and substantially catalyse aligned such that the rotating disc 11 may be rotated in either a clockwise or anticlockwise direction to align with the apertures 13 or 14 respectively. If used in a valve in which the apertures 13 and 14 are in communication with separate outlets from the valve, rotation of the rotating surface 11 in either the clockwise or anticlockwise direction can determine which of the outlets fluid will be directed to.

In this form, the valve is also provided as a gate valve having an off position. On this basis, three discreet arrangements are necessary and, therefore, each of the three apertures 13, 14 and 15 are provided to cover a substantially 120° sector within the valve surfaces 11 and 12.

As can be seen in Figure 2B, rotation of the valve surface 11 with respect to the lower valve surface 12 not only controls the direction of fluid but also the quantity of flow by controlling the degrees of rotation to either fully or only partially overlap the aperture 15 with, for example, the aperture 13.

The valve surface 11 which in this example, is provided as the rotating valve surface may be provided with engagement portions 16 to engage a suitable drive mechanism for either manual or motor driven rotation of the valve surface 11.

It should also be noted that, for simplicity, it is easier for the rotating valve surface 11 to be backed with a single aperture 15 rather than the dual apertures 13 and 14. If the dual apertures 13 and 14 are provided in the rotational disc, the communication to the outlets must also be able to accommodate that rotation.

In addition to accommodating flow from a single inlet to alternative outlets, the reverse may also be utilised with a single outlet being supplied by alternative inlets.

Referring to Figure 3, a valve 20 is shown having a valve body 21. This preferred embodiment provides a temperature control valve.

As can be seen in Figure 3, the valve body 21 may be provided with dual inlets such as an inlet 22 for connection to a hot water supply and an inlet 23 for attachment to a cold water supply. Valve surfaces 24 and 25 are again provided in this embodiment as overlapping discs with the disc 24 being free to rotate with respect to the disc 25. A rubber seal 26 may be provided on the inlet side of the valve surfaces to seal about the perimeter of the inlets 22 and 23.

An outlet 27 is provided on a distal side of the valve surfaces from the inlets 22 and 23 and, preferably, an intermediate mixing chamber 28 is provided between the valve surfaces and the outlet. A temperature sensor 29 may be provided in the mixing chamber or outlet 27 and connected to a suitable control means to control the temperature of the fluid at the outlet.

The use of suitable cooperating valve surfaces 24 and 25 can provide a variety of positions at which the mixes of fluid from the inlets 22 and 23 are varied. As a result, a controller connected to the temperature sensor 29 can control a drive means 20 which, in this preferred form, is provided as a stepper motor to control the rotation between the valve surfaces and hence the mix of fluid at the outlet. The drive means 30 may be connected by a suitable engaging portion 31 to the upper valve surface to control the rotation.

In substitution of the stepper motor, a combination of a motor and a gearbox may be utilised. In a preferred form, a gearbox 55 is utilised to increase the torque of the stepper motor and/or increase the number of incremental steps to provide fine adjustment on the control of the valve surfaces. Alternatively to a stepper motor, a DC motor may be utilised if desired.

A further embodiment is shown in Figures 4A and 4B. In this instance, the valve provides control over both the temperature and flow rate from the valve shown generally as valve 31. As with the previous embodiment, two inlets being a hot inlet 32 and cold inlet 33 are provided into a valve body 34. However, in this instance, two sets of cooperating valve surfaces 35 and 36 are provided to independently control the flow from each of the inlets. Again, suitable drive means such as stepper motors 37 and/or gearboxes may be provided to control rotation of the valve surfaces. A mixing chamber 38 may be provided on a distil side of the valve surfaces from the inlets and adjacent an outlet 39. It can be seen that in this embodiment, each of the pairs of valve surfaces 35 and 36 may be used to independently control flow from each of the inlets to a maximum full flow condition. Again a suitable

temperature sensor may be provided at or adjacent the outlet which may monitor the temperature and control the relative mixes of fluids from the two inlets to achieve the desired temperature. In addition, the flow rate may be metered or simply be incrementally adjusted to allow both sets of valves 35 and 36 to open to increase flow while maintaining a similar relative mix as determined by the temperature sensor. In this embodiment, the pairs of valves surfaces 35 and 36 require, at a minimum, one aperture in each of the two surfaces providing a cooperating pair and the shape of those apertures may be designed to provide an even variation in flow rate with rotation of one of the valve surfaces with respect to the other. Flowrate is an increment between fully closed and fully open and may be determined and controlled using feedback from a flow rate meter or pressure sensor 56.

In the embodiment shown in Figure 4B, it can be seen that the direction of the inlets and outlets has been reversed. In this instance, the motors may be arranged against an upper surface of the valve to provide an overall valve in which the largest dimension is smaller than the largest dimension of the arrangement shown in Figure 4A. This may be a desired arrangement for placement in wall linings and the like where room may be at a minimum.

In a further preferred embodiment, a combined valve is provided to control temperature, pressure and also direct the flow between alternative outlets. This apparatus is shown in Figures 5A to 5D.

As shown in Figures 5A to 5D, a fluid control valve 40 is shown which, in this preferred embodiment, may control the flow of hot and cold water independently to alternative outlets. The valve 40 may comprise a main body

portion 41 having hot and cold water inlets 42 and 43 respectively. Valve surfaces 44 and 45 may be provided in cooperating pairs acting to independently control the flow of hot and cold water respectively. These cooperating pairs may be provided as pairs of overlapping discs in accordance with the discs shown in Figures 2A to 2C.

It can be seen that the outlet from the valve surfaces 44 and 45 allows flow into either one of two mixing chambers 46 and 47, each connected with separate outlets 48 and 49. Further, control of the valve surfaces 44 and 45 and the rotation of one with respect to the other in each cooperating pair is provided by stepper motors 50 and 51. These stepper motors may be controlled by a control means such as the motor controller 4 in Figure 1 and maybe linked to a temperature sensor adjacent the outlet and/or a flow and/or pressure sensor if desired.

It can be seen that a valve of this type may be mounted in an installation to divert flow between, as shown in Figure 1, a shower head 8 or bath spout 9. The temperature at the outlet may be controlled through independent control over the flow of hot and cold fluid into the mixing chambers through the valves 44 and 45 by control of the stepper motors 50 and 51. Furthermore, as the valve surfaces 44 and 45 are independently controlled, the flow rate from the valve may be controlled by controlling the degree to which each of these valve surfaces are opened.

This assembly allows an electronic control over the direction, flow rate and temperature of fluid all in a single installation.

In all the valve assemblies, filters may be incorporated either within the

valve or upstream to inhibit the entry of particulate matter into the valve which may effect the valve control.

It can be seen in the various embodiments described that a variety of stepper motors, DC motors and gearboxes have been described. Each of these may be utilised in the drive of the fluid control valves and are interchangeable with each other. Similarly, both temperature controls and sensors and flow sensors are referred to in various embodiments. Again, one, either or both sensors may be utilised in various valve configurations.

A further item of notice that mixing chamber referred to in these embodiments may be outside of the remainder of the valve body. In such an instance, the sensors may be incorporated adjacent the outlet from the mixing chamber and the entire assembly may be considered as combining to provide a valve as described.

Thus it can be seen that the invention provides a variety of fluid control valves with advantages over the prior art and which can accumulate into a fluid control valve as shown in Figure 5 to provide a comprehensive fluid control in a shower and bath installation if desired.

Where in the foregoing description reference has been made to specific components or integers of the invention having known equivalents then such equivalents are herein incorporated as if individually set forth.

Although this invention has been described by way of example and with reference to possible embodiments thereof it is to be understood that modifications or improvements may be made thereto without departing from the scope or spirit of the invention.

THE UNIQUE COMPANY LIMITED

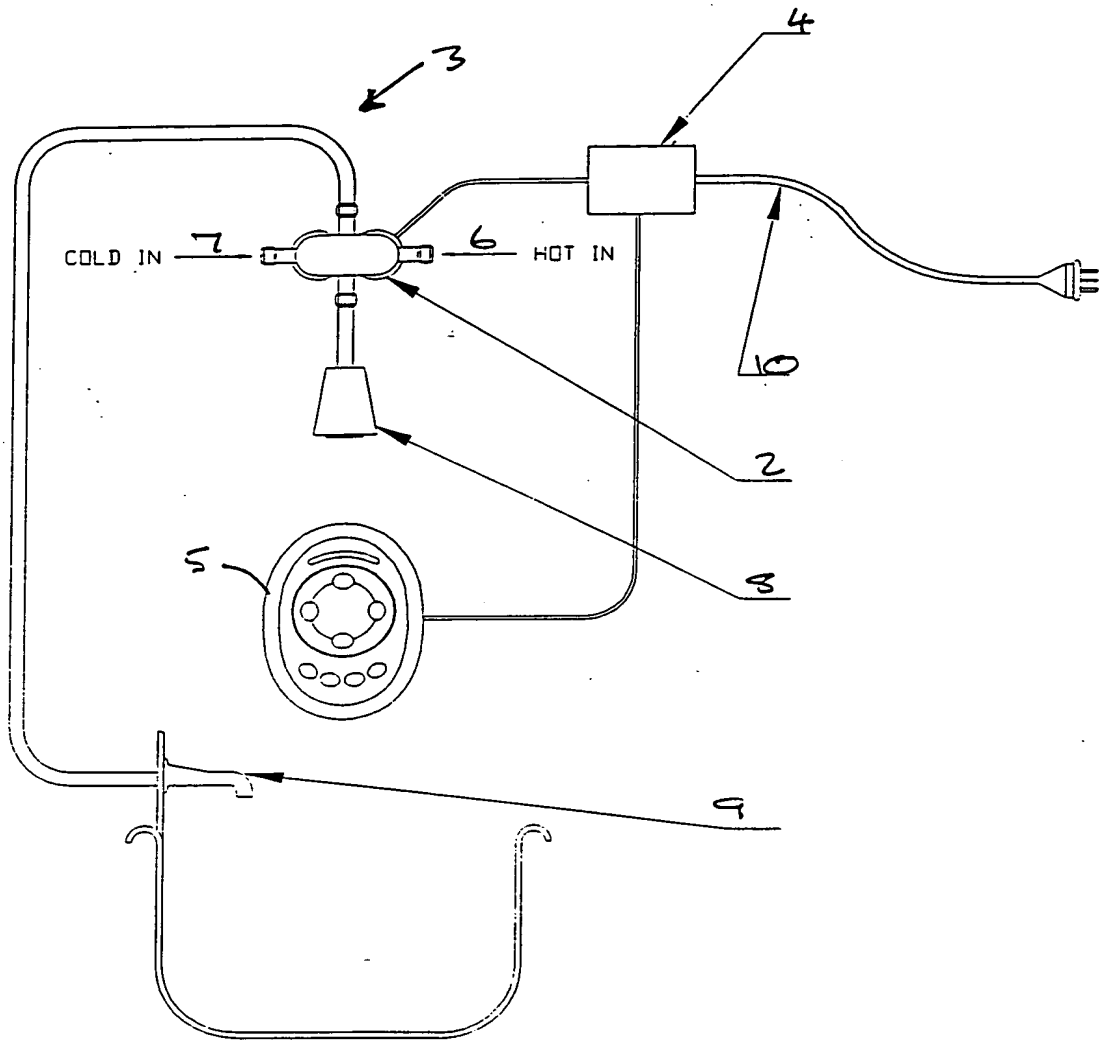
By Their Attorneys

BALDWIN SON and CAREY

7 October 1996

PSPEC40188

Figure 1



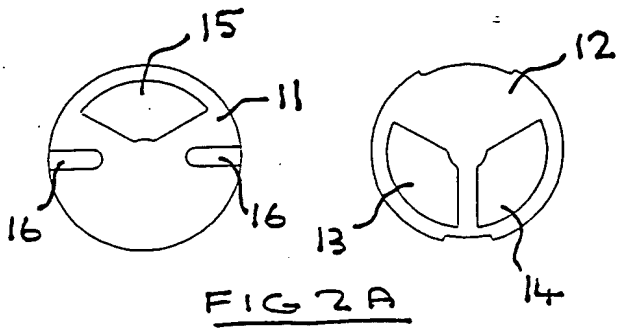


FIG 2A

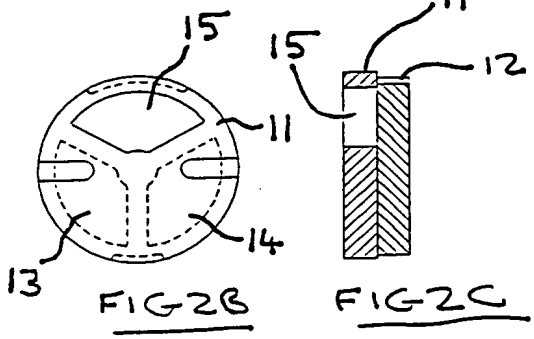


FIG 2B FIG 2C

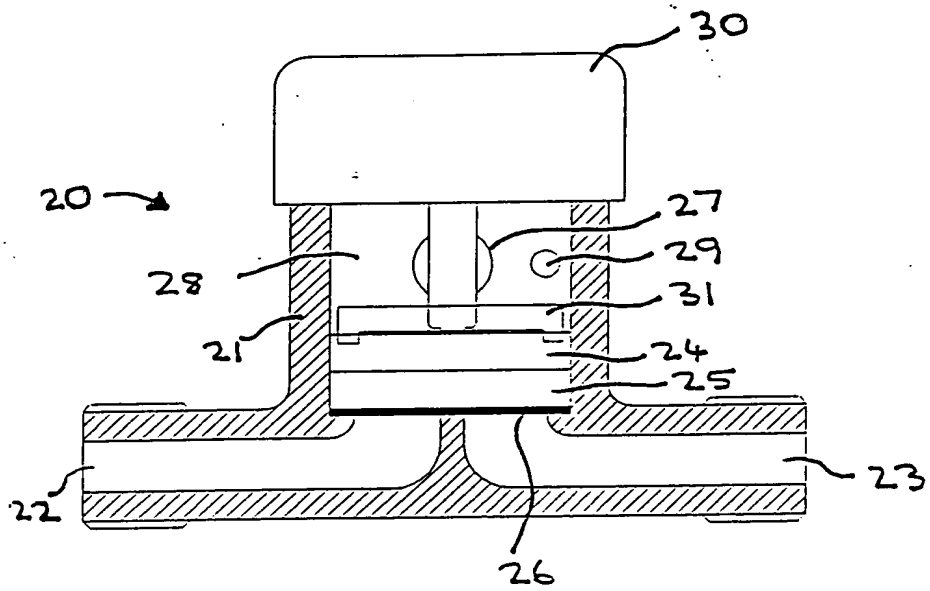


FIG 3

WITH
PROVISIONAL SPECIFICATION

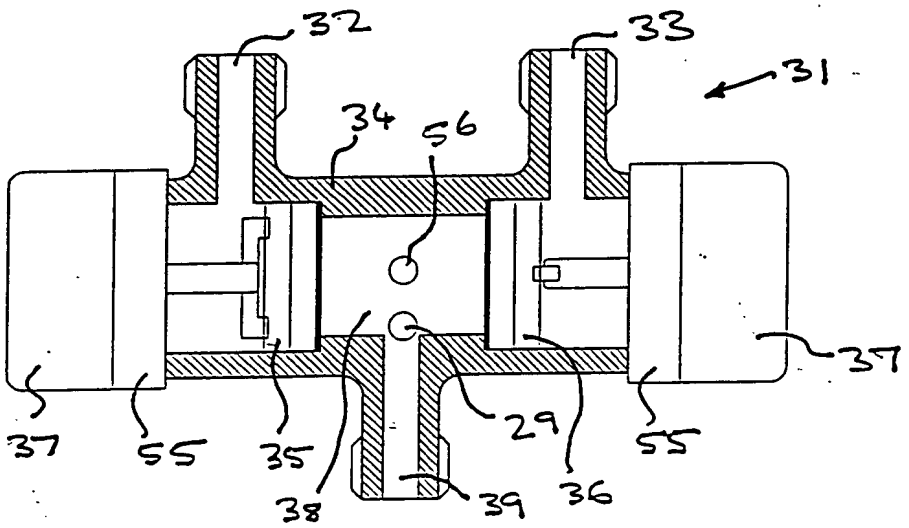


FIG 4A

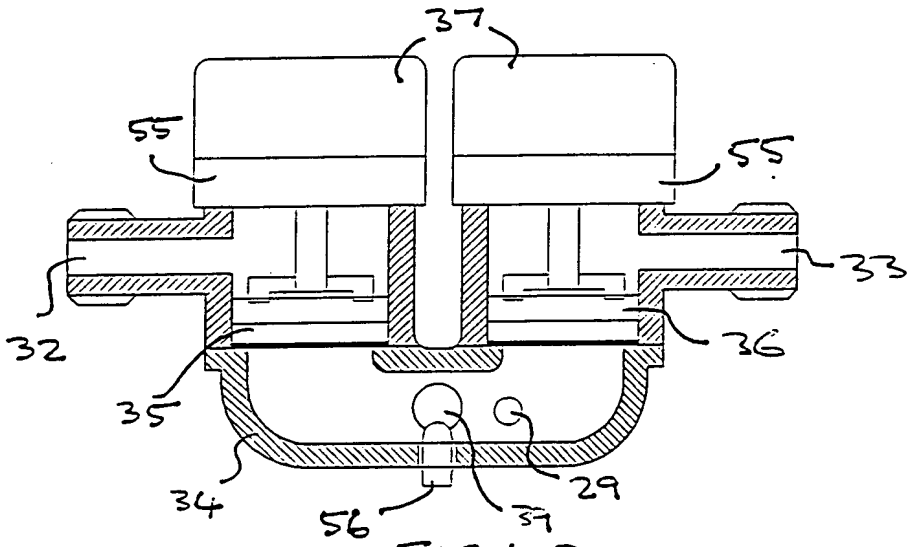


FIG 4B

WITH
PROVISIONAL SPECIFICATION

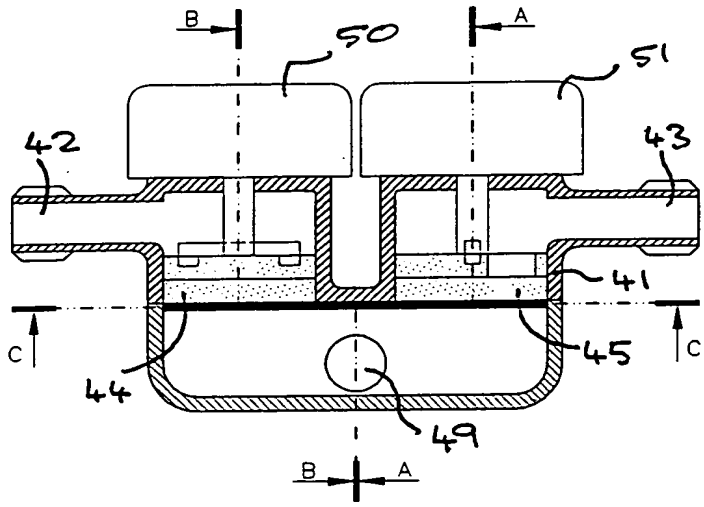
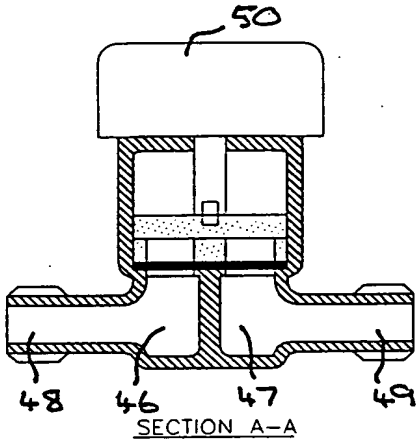
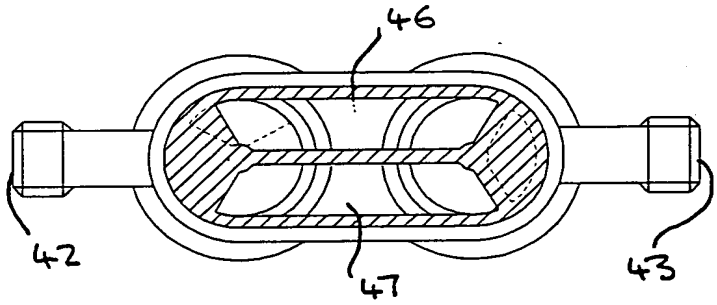


FIG 5A



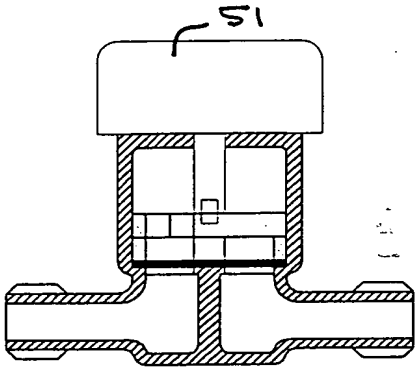
SECTION A–A

FIG 5B



SECTION C–C

FIG 5C



SECTION B–B

FIG 5D